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Efficacy of Diphacinone Baits for Controlling Black-tailed Prairie Dogs

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ABSTRACT

A field study was conducted in September - October, 1982, in Chouteau County, Montana, to investigate the potential of diphacinone rodenticide in reducing numbers of black-tailed prairie dogs (*Cynomys ludovicianus*). Although varying degrees of control were obtained with the diphacinone baits, simultaneous applications of strychnine and zinc phosphide grain baits were more efficacious. No conclusions could be determined concerning the influence on efficacy of diphacinone concentration, pellet size, or bait placement. Weather may have been a major controlling factor in the study.

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INTRODUCTION

When excessive damage to range, pasture, and croplands deems prairie dog (Cynomys spp.) control necessary, rodenticides such as sodium monofluoroacetate (compound 1080), strychnine, or zinc phosphide have been the traditional rodenticides used to reduce numbers. Compound 1080, a very effective control for prairie dogs, is no longer used because of potential hazards to other species, especially an endangered species, the black-footed ferret (Mustela nigripes). The U.S. Environmental Protection Agency (EPA) has also indicated concerns for the use of strychnine as a rodenticide (U.S. Environmental Protection Agency 1980) because of potential nontarget hazards. Further restrictions or possible cancellation of strychnine are presently being considered. Zinc phosphide can be an effective means of control but requires additional labor and cost for application since prebaiting (applying nontoxic grain prior to toxic bait) is necessary.

In recent years anticoagulant rodenticides (compounds which inhibit the blood clotting process and cause subsequent death by hemorrhaging) have been successful in reducing numbers of commensal rodents. Field and laboratory tests have shown that anticoagulant rodenticides such as diphacinone, chlorophacinone and bromadiolone may have potential as field rodenticides. Sullivan (1982) successfully reduced numbers of Columbian ground squirrels (Spermophilus columbianus) using diphacinone pellets and bromadiolone grain bait in portable bait stations. Since different species and individuals within a species may exhibit different tolerances, it is essential that rodenticides be tested on each target rodent species.

OBJECTIVES

The objectives of this study were:

1. To investigate the use of a diphacinone as a potential rodenticide for black-tailed prairie dogs (Cynomys ludovicianus).
2. To compare the efficacy of diphacinone pellets with strychnine and zinc phosphide grain baits for controlling black-tailed prairie dogs.
3. To compare the efficacy of surface and inside burrow baiting with diphacinone pellets.
4. To measure the comparative efficacy of bait containing 50 ppm and 100 ppm diphacinone.

STUDY AREA

The study area for this project was located approximately 22 miles northeast of Geraldine in Chouteau County, Montana. The

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area is best described as sagebrush grassland intermixed with dryland grain farming. The study was conducted on a state school section.

METHODS

The study site was divided into 10 plots, nine of which received different baiting treatments (Figure 1). The tenth plot received no treatment and was used as a control. Two formulations of diphacinone bait[a] were used in this study - 1/2 inch and 3/16 inch fish flavored pellets containing 50 ppm (0.005%) and 100 ppm (0.010%) diphacinone, respectively. Plots were treated with 4 ounces or 8 ounces per burrow either by scattering near burrow entrances or placing the bait inside each burrow entrance. Strychnine[b] and zinc phosphide[c] grain baits were also applied to separate plots by scattering one tablespoon or one teaspoon of bait, respectively, near burrow entrances. Treatments were not replicated because of restrictions on time, weather and materials.

Each treated plot consisted of a 10-acre (660 foot x 660 foot) counting area surrounded by baited buffer zone (Figure 1). The baited buffer zones (100 foot minimum width) served to isolate each counting area from adjacent treatments.

Visual observations of prairie dog activity before and after baiting were used as an index of the effectiveness of each treatment. Binoculars and a spotting scope were used to count active prairie dogs on each counting plot and the control plot for three consecutive days before and after bait application. Three visual counts were made on each plot from a common vantage point each day at approximately the same time. An average of the nine counts before treatment and nine counts after treatment provided, respectively, the pre and post treatment indices. Percent reduction in activity on each plot was calculated from the formula:

$$\text{Percent Reduction in Activity} = 1 - \frac{\text{post treatment index}}{\text{pre treatment index}} \times 100$$

All plots were observed for nontarget mortalities. The study was conducted during September 21 to October 15, 1982.

RESULTS AND DISCUSSION

Efficacy data for this study (Table 1) showed that percent reduction in prairie dog activity ranged from 96.8 to 26.8

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[a] Velsicol Chemical Company, trade name Ramik Green, EPA Reg. No. 876-185-AA.

[b] Sebesta's, whole oats, 0.44%, EPA Reg. No. 46135-2.

[c] Pocatello Supply Depot, USFW Service, rolled oats, 2.0%, EPA Reg. No. 6704-ID-1.

Figure 1. Schematic illustration showing treatments of Ramik green (diphacinone), zinc phosphide, and strychnine baits for controlling black-tailed prairie dogs.

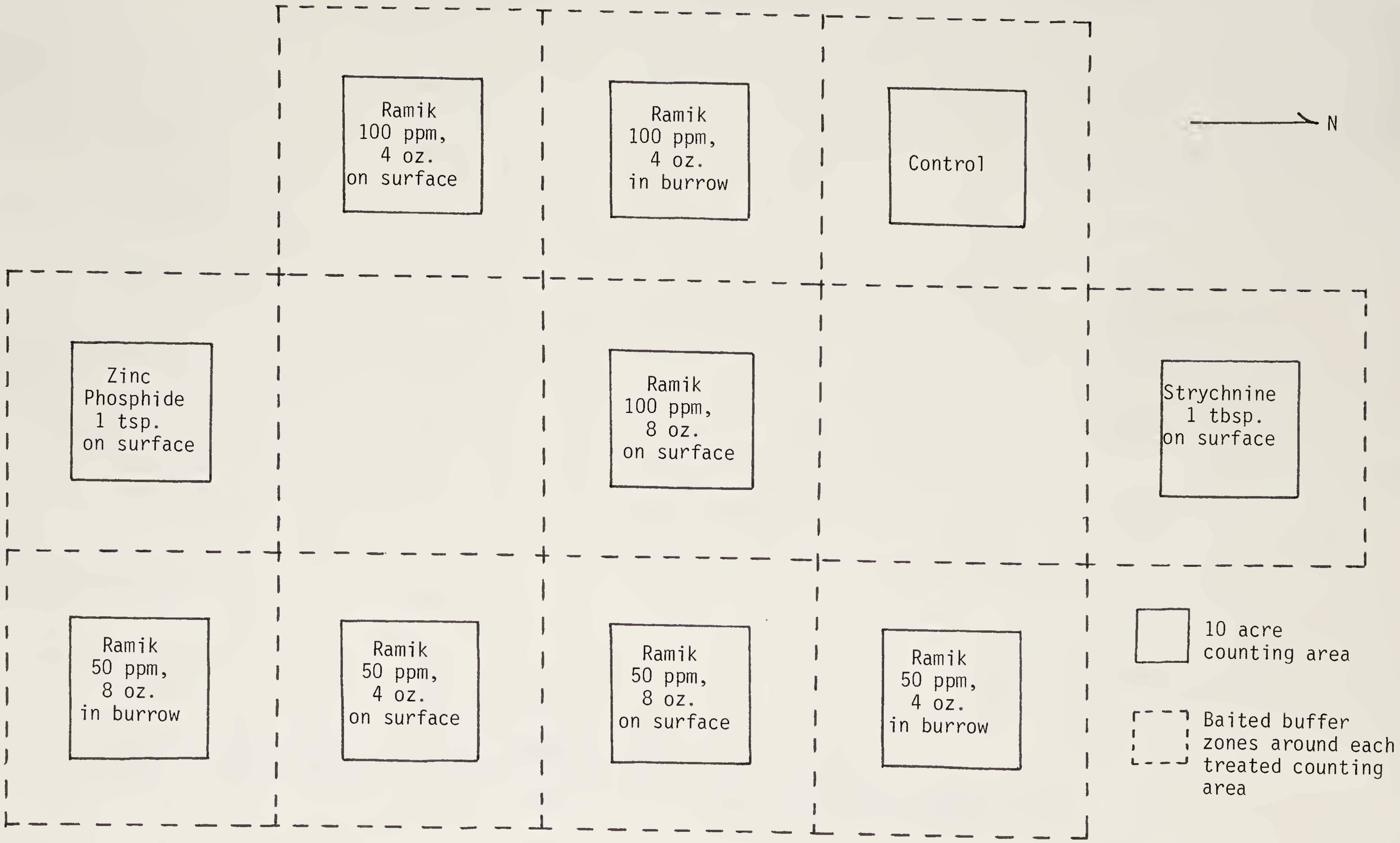

Table 1. A comparison of pre and post activity indices and percent reduction in activity of black-tailed prairie dogs when baited with various treatments of Ramik green (diphacinone) pellets and strychnine and zinc phosphide grain baits.

Treatment	Pre Treatment[a] Index	Post Treatment[b] Index	Percent Reduction[c] in Activity
Ramik - 50 ppm 8 oz. inside burrow	30.2	3.0	90.1
Ramik - 50 ppm 4 oz. on surface	41.8	10.9	73.9
Ramik - 50 ppm 8 oz. on surface	46.7	18.0	61.5
Ramik - 50 ppm 4 oz. inside burrow	38.3	14.0	63.4
Ramik - 100 ppm 8 oz. on surface	31.3	13.5	56.9
Ramik - 100 ppm 4 oz. inside burrow	21.7	7.5	65.4
Ramik - 100 ppm 4 oz. on surface	30.2	22.1	26.8
Control	33.7	33.0	----
Zinc phosphide - 1 tsp./burrow	46.3	1.5	96.8
Strychnine - 1 Tbsp./burrow	36.0	2.6	92.8

[a] An average of nine counts of active prairie dogs before baiting.

[b] An average of nine counts of active prairie dogs after baiting.

[c] Calculated by the formula: $$\text{Percent reduction} = 1 - \frac{\text{post treatment index}}{\text{pre treatment index}} \times 100$$

percent. Zinc phosphide and strychnine grain baits were the most effective treatments in reducing prairie dog activity (96.8 and 92.8 percent, respectively). The Ramik green treatments varied considerably in efficacy (90.1 to 26.8 percent). Eight ounces of 50 ppm Ramik placed inside burrows was the most efficacious treatment (90.1 percent). Doubling the diphacinone concentration did not appear to affect efficacy nor did placing bait inside the burrows. With no replication of treatments, further field data is needed on the influence of toxicant concentration, amount of bait, and/or bait placement.

Weather may have been a controlling factor during the study. Two days after bait application, rainy, snowy and muddy conditions (over two inches of precipitation) prevented access to the study area for a 14 day period. Two days appeared to be sufficient for good control with the strychnine and zinc phosphide baits. However, it is not known how well the Ramik bait was accepted in the 2 day post treatment period prior to the precipitation. A longer period of time may be needed for bait familiarization and the multiple feedings required for a lethal dose of diphacinone to be consumed by the prairie dogs. Very little residual Ramik bait could be found 16 days post treatment. Only fragments of the 1/2 inch pellets were occasionally seen near nonactive burrows. It is assumed that prairie dogs consumed the bait. However, some bait may have been dissolved by the heavy amounts of precipitation. Further field observations are needed to determine the rate of consumption of Ramik green and other pelleted bait materials. Perhaps flavors other than fish would prove to be more acceptable to black-tailed prairie dogs.

Other factors not tested in this study needing further investigation are economics, nontarget hazards and LD_{50} determination. The application rates of four and eight ounces of Ramik green per burrow resulted in huge amounts of bait being applied. At a bulk cost of approximately $1.50 per pound and an average density of 30 prairie dog burrows per acre, cost of Ramik green would be $11.25 and $22.50 per acre, respectively, for the four and eight ounce application rates. Using an application rate of one pound per acre, this compares to a bait cost of approximately $1.00 and $.40 per acre, respectively, for strychnine and zinc phosphide grain baits applied without prebaits.

Although no nontarget mortalities were observed in this study, domestic and wild ungulates, dogs, wild canids and predators may be attracted to the fish flavored Ramik green pellets. The large amount of bait present and the pellet size (especially the 1/2 inch pellet) may provide a ready food source for these animals.

Since different species and individuals within species vary in tolerance and resistance to toxicants, it is of utmost importance to determine the LD_{50} of diphacinone (or any other toxicant) for each target species. Knowing the LD_{50} of diphacinone for

prairie dogs will greatly assist in determining toxicant concentration, bait application rates, economics and nontarget hazards.

CONCLUSIONS

Although Ramik green diphacinone bait did have some variable effect on reducing black-tailed prairie dog activity, more field trails under better weather conditions may be needed for a more accurate comparison with other toxicants. The cost of present formulations of Ramik green may be prohibitive in treating large acreages.

ACKNOWLEDGEMENT

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